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DESIGN OF EXPERIMENTS AND RELIABILITY MODELS<US
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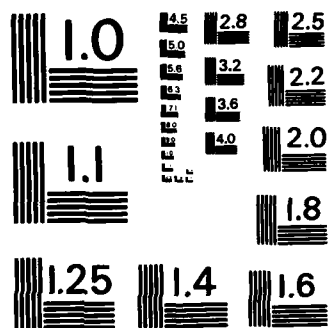


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FINAL SCIENTIFIC REPORT
GRANT AFOSR-80-0170
'DESIGN OF EXPERIMENTS AND RELIABILITY MODELS'

Professor A.S. Hedayat
Department of Mathematics
University of Illinois at Chicago Circle
Chicago IL 60680

I. Design of Experiments:

Our research activities during the past year have included the production of numerous research reports and the presentation of research results at conferences held in the U.S. and abroad. Recent scientific reports include:

1. Hedayat, A. and Khosrovshahi, G.B. An algebraic study of BIB designs: A complete solution for $v=6$ and $k=3$. J. Combinatorial Theory, Series A, 30, (1981), 43-52.
2. Constantine, G.M. Some E-optimal block designs. Ann. Statist. 9, (1981), 886-892.
3. Ash, A. Generalized Youden designs: Construction and tables. J. Statistical Planning and Inference 5, (1981), 1-25.
4. Hedayat, A. Study of optimality criteria in design of experiments. Statistics and Related Topics. (M. Csorgo, D.A. Dawson, J.N.K. Rao, A.K.Md.E. Saleh (eds.)) pp. 39-56 (1981). North Holland Publishing Co.
5. Constantine, G. and Hedayat, A. A construction of repeated measurements designs with balance for residual effects. J. Statistical Planning and Inference 6 (1982), in print.
6. Hedayat, A. Repeated measurements designs, IV. Proc. 43rd of ISI, in press, 1981.
7. Constantine, G.M. and Hedayat, A. BIB designs with blocks of maximal multiplicity. Technical Report, Department of Mathematics, University of Illinois, Chicago (1981). Submitted for publication.
8. Cheng, C.S., Constantine, G.M. and Hedayat, A. A unified method for constructing PBIB designs based on triangular and L_2 schemes. Technical Report, Department of Mathematics, University of Illinois, Chicago (1982). Submitted for publication.

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9. Hedayat, A. and Hwang, H. BIB (8,56,21,3,6) and BIB (10,30,9,3,2) designs with repeated blocks. Technical Report, Department of Mathematics, University of Illinois, Chicago (1981). Submitted for publication.

10. Lin, B. On probability proportional to size sampling designs: Their construction, algebraic properties, and applications. Technical Report, Department of Mathematics, University of Illinois, Chicago (1981).

11. Majumdar, D. Optimal incomplete block designs for comparing treatments with a control. Technical Report, Department of Mathematics, University of Illinois, Chicago (1981). Submitted for publication.

II. An Overall View of Our Research:

In performing research we have always kept the applicability of our results in mind. We have never generalized or extended a result without justifying the practical importance of the problem under consideration.

The results we have obtained may not be accessible to practitioners with limited knowledge of the subject at hand. In our formal publications we had to be very technical. While such publications will be easily accessible to research workers in the area, it would certainly be very hard, if not impossible, to be understood by practitioners. To overcome this deficiency we are preparing nonformal versions of our results understandable to non-specialists. As of today, we have prepared three catalogs of designs of practical sizes in the area of BIB designs with repeated blocks and repeated measurements designs. Additional catalogs of designs are currently under preparation.

III. Presenting Research Results at International Conferences Held in the U.S. and Abroad:

As invited speakers, we presented our newly discovered results at the international meetings sponsored by the Institute of Mathematical Statistics, the American Statistical Association and the International Statistical Institute. We also presented invited papers at the International Conference on Optimization in Statistics held at the Indian Institute of Technology in Bombay; International Symposium on Combinatorial Mathematics and Optimal Design held in Colorado State University; Fifth International Conference on Statistics, Computer Science and Social Research held in Cairo, Egypt; International Symposium on Statistics and Related Topics held in Carleton University, Canada; and the 43rd Session of International Statistical Institute held in Buenos Aires, Argentina. The participation in these meetings was quite stimulating, as we were able to discuss in person with other scientists around the world, the results and the difficulties in

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Chief, Technical Information Division

pursuing our research. Through these meetings it has become possible to generate an informal line of communication with other researchers from universities in the United States and other countries --- such informal contacts are essential in pursuing our research.

IV. Reliability:

Since the beginning of the grant on August 1, 1981, the following paper has been revised and accepted for publication.

1. A Multivariate NBU Class Derived from a Shock Model (with F. Proschan and J. Sethuraman), Operations Research (10 typed pages).

The following report has been completed.

2. A Survey of the Dynamic Models for Multistate Coherent Systems.

The following two reports are near completion and will be submitted shortly for publication.

3. Classes of Multivariate New Better Than Used Stochastic Processes (to be submitted to the Journal of Stochastic Processes and its Applications).

4. Recent Developments in the Theory of Multistate Systems (with F. Proschan), to be submitted to a special edition of Operations Research devoted to reliability.



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report summarizes the results of research under the grant during the period 1 June 1981 to 31 July 1982. The report lists published papers and reports, both in the area of design of experiments and in reliability. Also reported on are conferences attended and presentations made, and a brief summary of results.		